Sub a1

Claims

1. Apparatus for treadmill training of walking-disabled patients, comprising a treadmill, a relief mechanism for the patient, and a driven orthotic device, characterized in that means for stabilizing the orthotic device (6) are provided that prevent the patient from tipping forward, backward and sideward; that the orthotic device (6) consists of a hip orthotic device and two leg parts (80a, 80b), whereby two hip drives (76a, 76b) are provided for moving the hip orthotic device, and two knee drives (75a, 75b) are provided for moving the leg parts; that hip orthotic device and leg parts (80a, 80b) are adjustable, whereby the leg parts (80a, 80b) are provided with cuffs (72a, 72b, 73a, 73b, 74a, 74b) which are adjustable in size and position; and that a control unit (141) is provided for controlling the movements of the orthotic device (6) and controlling the speed of the treadmill (1).

2. Apparatus as claimed in Claim 1, characterized in that a parallelogram (5) that is fixed in a height-adjustable manner on the railing (3) of the treadmill (1) is provided as a mean for stabilizing the orthotic device (6).

3. Apparatus as claimed in Claim 2, characterized in that the parallelogram (5) consists of a base frame (20), an orthotic device part (21), and two carriers (22a, 22b) that are interconnected via bearings (23a – 23d); that on the base frame (20), on the one lower side, a first bearing element (27) is attached, with which first bearing element the base frame (20) or, respectively, the parallelogram (5) is positioned in a rotatable manner and is fixed on the first rail (3) of the treadmill (1) in a height-adjustable manner; that on the base frame (20) on the other lower side a second bearing element (28) that can be flipped open and closed is attached, with which second bearing element the base frame (20) or, respectively, the parallelogram (5) can be locked to the second rail (3) of the treadmill (5) after the completed rotating movement around the first bearing element (27); and that an orthotic device holder (24) that is provided with means for attaching the orthotic device (6) is attached to the orthotic device part (21).

4. Apparatus as claimed in Claim 2 or 3, characterized in that a relief mechanism is attached to the parallelogram (5) for compensating the weight of the orthotic device (6), whereby preferably a gas pressure spring (29), a counter weight, or a mechanical spring is provided for this purpose.

5. Apparatus as claimed in Claim 1, characterized in that as a mean for stabilizing the orthotic device (6), a rod (48) that is attached to it has been provided, said rod being guided in a guide pipe (46) which again is attached in a drivable manner to the ceiling, whereby a roller guide with rollers (55a – 55d, 56a – 56d) that is guided in guide tracks (50a, 50b) has been provided for forward, backward and sideward stabilization.

6. Apparatus as claimed in one of Claims 1 - 5, characterized in that the hip orthotic device is adjustable in its width.

7. Apparatus as claimed in one of Claims 1 – 6, characterized in that the leg parts (80a, 80b) consist of leg braces (63a – 66a, 63b – 66b) that can be moved inside each other so that the leg parts (80a, 80b) are adjustable in length.

8. Apparatus as claimed in one of Claims 1 – 7, characterized in that the leg parts (80a, 80b) are provided with cuffs (72a, 72b, 73a, 73b, 74a, 74b) that can be adjusted continuously 'anterior-posterior' and 'medial-lateral'.

9. Apparatus as claimed in one of Claims 1 – 8, characterized in that the cuffs (72a, 72b, 73a, 73b, 74a, 74b) consist of a semi-round hoop (126) and a tape (131); and that the tape (131) is attached to the hoop (126) in such a way that it can be freely wound around a rotary axis in the center of the patient's leg.

10. Apparatus as claimed in Claim 9, characterized in that the different settings of the orthotic device (6), such as hip width, leg lengths, and cuff positions, are marked with marks (70, 71, 91, 92, 124, 125).

11. Apparatus as claimed in one of Claims 1 – 10, characterized in that a control unit (141) is provided for controlling the drives (75a, 75b, 76a, 76b) of the orthotic device (6), the input values of said control unit being user data (142), the output values being control signals (143a, 143b) for the orthotic device and the treadmill, and its control value being measuring values (144).

12. Apparatus as claimed in one of Claims 1 – 11, characterized in that a ball screw spindle drive is provided for each knee drive (75a, 75b) and hip drive (76a, 76b).

13. Method for operating an apparatus as claimed in one of Claims 1 – 12, characterized in that the orthotic device (6) is turned away from the treadmill (1) in order to permit the patient to gain access to the treadmill (1); that the orthotic device (6) is positioned above the treadmill (1) and is fixed to the patient, whereby the orthotic device (6) is relieved by a relief mechanism; and that the orthotic device (6) is driven and controlled, and the treadmill (1) is driven and controlled.

14. Method as claimed in Claim 13, characterized in that the parallelogram (5) is positioned with the orthotic device (6) at the railing (3) of the treadmill (1) in such a way that it can be opened towards the back, whereupon the patent is driven in the wheel chair onto the treadmill (1); that the patient is secured in the treadmill belt (16) or hung above the treadmill (1); and that then the orthotic device (6) is rotated from the back at the parallelogram (5) onto the treadmill (1) and is tightened on the suspended patient.

15. Method as claimed in Claim 13 or 14, characterized in that the drives (75a, 75b, 76a, 76b) of the orthotic device (6) are controlled by a control unit (141) in such a way that the legs of the patient are moved in a natural, physiological walking pattern on the treadmill (1), whereby the desired curves (142d) necessary for creating the physiological sequences of movement are adapted by the control unit (141) based on the entered patient-specific settings (142c) and respective measuring values (144).

16. Method as claimed in one of Claims 13 – 15, characterized in that the movements of the orthotic device (6) are synchronized with the treadmill speed.

17. Method as claimed in one of Claims 13 – 16, characterized in that the control unit (141) synchronizes the movement of the legs with or adapts it to the speed of the treadmill (1) in that a trigger unit (148) signals the beginning of a standing phase and thus the course of the sequence of movements over time with a trigger signal (149), and the desired curves (142d) are output to the drives (75a, 75b, 76a, 76b) of the orthotic device (6), adapted appropriately as control signals (143a).

18. Method as claimed in one of Claims 13 – 17, characterized in that the settings of the adjustable orthotic device (6) are read at the markings (70, 71, 91, 92, 124, 125), are stored, and reconstructed.